

Aeronautics Test Program

The Aeronautics Test Program, part of NASA's Aeronautics Research Mission Directorate, ensures the capability, availability and accessibility of an extensive suite of testing facilities to meet NASA and other U.S. aeronautics needs.

The flight operations and test infrastructure is located at four NASA centers:

- Ames Research Center
Mountain View, Calif.
 - Wind tunnels
- Dryden Flight Research Center
Edwards, Calif.
 - Test bed aircraft, support aircraft, test range, simulation and flight load laboratories

- Glenn Research Center
Cleveland
 - Wind tunnels, icing research tunnel, propulsion system facilities
- Langley Research Center
Hampton, Va.
 - Wind tunnels, spin tunnel, aerothermodynamics testing facilities

Ground and flight test capabilities are used by NASA, other government agencies and commercial customers to test and demonstrate new technologies, materials, structures and flight concepts, and to explore and understand aeronautical behaviors and phenomena.



Images (Clockwise, left to right) **Hypersonic Speed:** An air-breathing scramjet engine model is tested in NASA's 8-Foot High-Temperature Tunnel, which simulates flight conditions from Mach 3 to Mach 7. **Support Aircraft:** A view from a NASA chase plane during a test flight of the blended wing body X-48B in April 2008. **Propulsion Testing:** Technicians and researchers pause during a jet engine test set up in the Propulsion Systems Laboratory. **Wind Tunnels:** A model of the new EA-18G Navy attack aircraft being tested for aerodynamic force and moment data in the 11- by 11-Foot Transonic Wind Tunnel.

GROUND TEST FACILITIES

Subsonic Wind Tunnels (Mach <1)

- **9- by 15-Foot Low-Speed Wind Tunnel** (NASA Glenn): Aerodynamic performance and acoustic characteristics of fans, nozzles, inlets and propellers
- **14- by 22-Foot Subsonic Tunnel** (NASA Langley): Performance testing of fixed-wing and rotorcraft configurations
- **20-Foot Vertical Spin Tunnel** (NASA Langley): Free-spin tests to isolate potential spin modes and control techniques required for spin recovery
- **Icing Research Tunnel** (NASA Glenn): Testing of issues related to aircraft icing

Transonic Wind Tunnels (Mach 0.8 – 1.2)

- **National Transonic Facility** (NASA Langley): Cryogenic and air testing, and configuration aerodynamics validation for both full- and half-span models of existing and new vehicle concepts
- **Unitary Plan Facility** (NASA Ames): Airframe development and aerodynamic studies, with a vital and continuing role in the U.S. crewed spaceflight program
- **Transonic Dynamics Tunnel** (NASA Langley): Testing of large aeroelastically scaled models

Supersonic Wind Tunnels (Mach 1.2 – 5.0)

- **10- by 10-Foot Supersonic Wind Tunnel** (NASA Glenn): Testing of supersonic aerodynamic and propulsion components such as inlets and nozzles, integrated propulsion systems, full-scale jet and rocket engines and launch-vehicle concepts
- **9- by 7-Foot Supersonic Wind Tunnel** (NASA Ames): Evaluations of domestic fixed-wing airframes; ascent and reentry aerodynamic data for crewed space vehicles
- **4-Foot Supersonic Unitary Plan Wind Tunnel** (NASA Langley): Basic fluid dynamics research and development, assessment and optimization of advanced aerospace vehicle concepts
- **8- by 6-Foot Supersonic Wind Tunnel** (NASA Glenn): Studies of aerodynamic and propulsion models at subsonic, transonic and supersonic speeds from Mach 0.25 to 2.0

Hypersonic Wind Tunnels (Mach ≥ 5)

- **Aerothermodynamics Laboratory** (NASA Langley): Fundamental flow-physics research, aerodynamic performance measurements and aero-heating assessments
- **8-Foot High-Temperature Tunnel** (NASA Langley): Tests requiring flight conditions at Mach 3 to 7 for large air-breathing propulsion systems and thermal-protection system components

Propulsion Systems Laboratory

The Propulsion Systems Laboratory (NASA Glenn): A full-scale, high-altitude, high-speed (to Mach 4) engine test facility for air-breathing propulsion systems research and development.

FLIGHT OPERATIONS AND TEST INFRASTRUCTURE

Located at NASA Dryden, these facilities and aircraft provide critical support to researchers, designers and manufacturers:

Flight Loads Laboratory

Combined mechanical-load and thermal studies of structural components and complete flight vehicles; capability to calibrate and evaluate flight-loads instrumentation under anticipated in-flight conditions

Research Aircraft Integration Facility

Simulations to verify and validate complex designs of aerospace vehicles and their sub-systems prior to flight

Western Aeronautical Test Range

Tracking, communications and data management to support technology integration, space exploration concepts, airborne remote sensing and a wide variety of science missions

Support and Test Bed Aircraft

NASA's fleet of support aircraft—F/A-18, T-38, T-34C, B200 King Air— provides video, photo and safety-chase support for NASA, the Department of Defense, the Federal Aviation Administration and other U.S. agencies and institutions. Test bed aircraft—F-18, F-15B, ER-2, Global Hawks, G III— can be instrumented in a variety of configurations to meet testing requirements.

We're Working on...

Assessing U.S. subsonic and hypersonic wind tunnels in collaboration with the National Partnership for Aeronautical Testing

Supporting the Boeing Company in ongoing flight tests of the X-48B, a remote-piloted subscale test vehicle using the blended wing body design

Starting a five-year program of recapitalization and maintenance projects in all Aeronautics Test Program facilities

National Aeronautics and Space Administration

Headquarters

300 E. Street, SW
Washington, DC 20546

www.nasa.gov

For more information about the Aeronautics Test Program and NASA aeronautics research, visit www.aeronautics.nasa.gov/atp/.